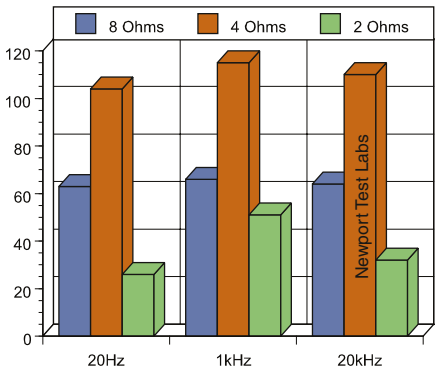
Moon i-1

Stereo Integrated Amplifier

No doubt you've already heard that Canadian outfit Simaudio, which manufactures Moon equipment, released the Moon i-5 integrated amplifier earlier this year and if you look at the photograph above, you could be forgiven for thinking it is of the new Moon i-5 because, to all intents and purposes, the two integrated amplifiers are externally identical. Indeed so far as I can see—and I stand to be corrected—the only difference between the two (other than price, with the i.5 being the less expensive of the two, and thus the company's new 'entry-level' amplifier) is that the i-1 is rated at 50-watts per channel into 8Ω and the i-5 is rated at 40-watts per channel into 8Ω.

The Equipment

For a company that manufactures some spectacular-looking and completely individual products (the CD5.3 CD player and i5.3 dual-mono integrated come immediately to mind) Moon seems to have been playing it safe of late: obviously by intention, hence the 'Classic Series' moniker that attaches to the Moon i-1. Which is not to say that the i-1 doesn't look the part, because it's superbly finished, oozing class from every pore of its incredibly solid chassis. (Moon says it specifically addressed the issue of chassis rigidity with the i-1, so as to minimise the effects of external vibrations.)



Power Output: Single channel driven into 8-ohm, 4-ohm and 2-ohm non-inductive loads at 20Hz, 1kHz and 20kHz. [Mi-1]

Despite the relatively modest size of the i-1 chassis (430×75 ×325mm WHD), the amplifier dissipates heat so effectively that it runs cooler than most other similarly-powered amplifiers, which Simaudio claims will result in 'a longer than normal life expectancy'. Indeed it runs so cool that it's designed to be powered-up continually, so it's able to deliver optimum performance the instant you want to start listening. One reason Simaudio's been able to shoehorn all this into such a small package is that it's done away with the usual internal (and external) heatsinks. Instead, the two pairs of perforated emitter bipolar output devices (MJL21193/21194) are directly attached to the chassis itself. As you can see, there's plenty of ventilation supplied, but despite this, Simaudio is playing it safe (beginning to notice a trend here?) by specifically stating that you should *never* place another component directly on top of it. Also, because there are ventilation slots on the bottom, it should always be placed on a hard surface. As you've probably already guessed from the low profile of the amplifier (75mm), Simaudio is using a flat (and very large) toroidal mains power transformer, whose 26-volt rails are rectified by a discrete diode bridge before being smoothed by a pair of small 63V/10,000µF capacitors.

The Moon i-1's front panel is notable for having, in addition to the usual source selectors (CD, DVD, Tuner, Video and Aux), a special 'MP' selector, which selects the 3mm 'MP in' socket located at the far right of the front panel, alongside the 6.5mm headphone socket. I had to resort to opening the instruction manual to discover that 'MP' stood for 'Media Player', even though I'd guessed its intended application right at the outset. I'd like to hope that Simaudio is at least a tad embarrassed about encouraging Moon owners to use a portable audio player as a music source, but I won't hold my breath. (And yes, I do know that modern 'Media Players' can store high-resolution digital audio files, but the plain truth is that most people still store low bit-rate MP3 files on their portables, and I think helping facilitate the use of such low-res audio files on high-end hi-fi components is a travesty… but perhaps that's just me.)

If you have been paying attention and comparing the number of buttons I have so far mentioned with the number visible on the front panel, I should tell you that the two I haven't mentioned are for 'Mute' and 'Speaker On/Off.' (And that what looks like a button at the far left of the row is actually a cunningly disguised infra-red receiver, for picking up IR commands

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> "Gone are the days when smaller specialist manufacturers such as Simaudio could afford to include uniquely designed hand-made remote controls with their products."

from the supplied remote.) The 'Speakers Off' button is, literally, that, because the Moon i-1 has only a single set of (fairly ordinary, it must be said) multi-way loudspeaker terminals.

The rear panel of the Moon i-1 has, in addition to the essential gold-plated RCA input sockets, a set of gold-plated pre-out RCA terminals. There are also 'SimLink' inputs and outputs (to allow system integration when using other SimAudio products), and a bi-directional RS232 socket for custom home integration. Simaudio provides a standard IEC three-pin mains power socket, with integral mains power switch, so if you do want to be able to switch the i-1 completely off, you'll have to ensure you can always reach around the back!

Gone are the days when smaller specialist manufacturers such as Simaudio could afford to include uniquely designed hand-made remote controls with their products. The result is that the i-1 is supplied with a typical 'plastic' remote control. Not having the world's best eye-sight, I found the indistinct dull grey lettering quite hard to read, particularly since it was on a dark background. Although the muting logic on the remote control is correct (that is, the muting circuit disengages whenever you access the volume buttons), the same isn't true if you use the front-panel volume control, in which case the muting circuit will keep the amplifier muted no matter whether you turn the volume up or down.

Listening Sessions

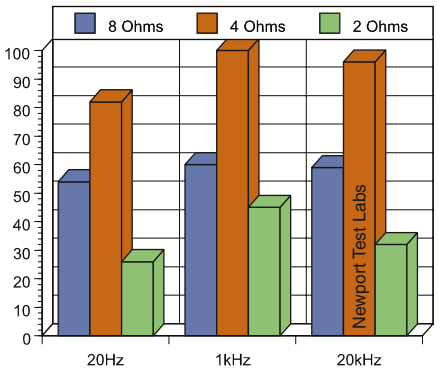
'Safe' though the look of the Moon i-1 may be, there's no denying it looks good. On its own, it could be a little on the narrow side for some, but once you've paired it with the cosmetically identical Moon CD-1, for example, the visual balance is perfect.

I trialled the Moon i-1 with quite a few different pairs of loudspeakers, ranging from a pair of Wilson Sophia 2s to a tiny pair of Paradigm Reference Studio 10v5s. The Moon acquitted itself perfectly with all of them, but if I were to make a general overall recommendation about speaker selection, it would be to prefer fairly efficient loudspeakers, preferably rated at more than 87dBSPL, because while the i-1 proved sufficiently powerful to drive all the speakers I trialled to sound pressure levels that would most assuredly be 'deafening', there was more of a sense of 'ease' when using high-efficiency speakers at high volume than when I was using low-efficiency speakers. If you play at normal listening levels—or even higher than normal!—you can ignore this advice, because when I say 'deafening' I *mean* deafening!

Fortunately, the most desirable traits of the Moon i-1 reveal themselves at much, much lower levels, as I discovered whilst re-discovering a CD that had slipped itself down the back of my CD library shelf, titled Musica Antiqua, by Ensemble La Reverdie. I'd be the first to admit that the music on it might not be for everyone, as it consists entirely of a songs and ballads from the middle ages, but they're actually all quite catchy tunes (they had to have been, to have survived so long!) and the sounds on the disc are glorious, whether it's the vocals of the four sisters who comprise the Ensemble La Reverdie to the sounds of the rarely-heard instruments they play, which include the gothic harp, rebec, bodran and timbrel as well as the 'classics' such as the recorder (C descant, G treble and C tenor), tabor, lute and 'fiddle.' The recording (Giulia GS201007), which is in a natural but not too reverberant

- Build quality
- MP input

- Plastic remote
- Muting logic



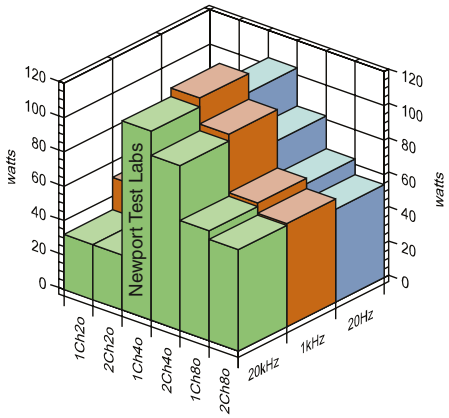
Power Output: Both channels driven into 8-ohm, 4-ohm and 2-ohm non-inductive loads at 20Hz, 1kHz and 20kHz. [Mi-1]

Moon i-1 Stereo Integrated Amplifier

Brand: Moon
Model: i-1
Category: Integrated Amplifier
RRP: $2,500
Warranty: Two Years
Distributor: Valhalla Audio Pty Ltd
Address: PO Box 403
Pymble, NSW 2073
T: (02) 9983 1828
F: (02) 9983 0394
E: info@valhallaaudio.com.au
W: www.valhallaaudio.com.au

LAB REPORT

Readers interested in a full technical appraisal of the performance of the Moon i-1 Integrated Amplifier should continue on and read the LABORATORY REPORT published on the following pages 76 & 78. Readers should note that the results mentioned in the report, tabulated in performance charts and/or displayed using graphs and/or photographs should be construed as applying only to the specific sample tested.



Power Output: Single and both channels driven into 8-ohm, 4-ohm and 2-ohm non-inductive loads at 20Hz, 1kHz and 20kHz. [Mi-1]

acoustic, is stunningly clear, so that every note is separated from each other, yet blended as necessary when harmonic complexity is required. The generally slow pace with which the disc proceeds allows you to savour every single note—and every single sound—as well as admire the complete absence of background noise both on the recording, and from the Moon i-1. The unamplified, unadorned female voices also highlight the superb accuracy of the Moon i-1's midrange sound, not to mention its smooth, completely uncoloured delivery.

From there I decided to move slowly forward in musical time, and span up Fauré's *Requiem* (Op 48) which is a sentimental favourite of mine by virtue of having been first performed (in 1988) in the church after which my daughter was named. It's beautifully serene in all its incarnations (several significantly different versions are available on CD, but I rather like the one on IMP with the Choir of the Westminster Cathedral and the City of London Sinfonia) but perhaps most notable for its harmonic richness, particularly for vocals, and on this disc, the choristers are outstanding, both ensemble and solo. Again, the recording quality is outstanding, with the acoustic of St Judes hovering omnipresent in the background, but never overpowering the performance. The depth of sound that this acoustic adds to the string sound is truly magical, with an underlying majesty that has to be heard to be believed. What I was listening for here was how well the Moon i-1 could render the entire musical canvas, and I was not disappointed, with the choral swells surging like long ocean waves and the brass fanfares punching though effectively, yet not overly stridently. With this disc, the entire audio spectrum is being used for much of the time and the Moon i-1 delivered in spades.

Skipping more than one hundred years forward to Tiësto's new Kaleidoscope album (Liberator), the Moon i-1 proved that it's also up for modern electronica. The trance-y title track that leads off this CD has so many sounds multi-layered over each other that lesser amplifiers can lose track, both with tone and timing, but the Moon i-1 kept right up to the mark in both departments, and I could hear how precisely the amp was maintaining the balance between the left and right when the cymbals cross around 4:15 in. This is also a great track for appreciating the bass delivery, and the fact that even while it's delivering the high-powered engineered bass, the vocals and other higher-frequency sounds (of which there are many) are completely unaffected. The highlight for me is a toss-up between *I Will Be Here*, which features local talents Sneaky Sound System (I'd be surprised if you haven't heard this track already on radio or TV) and *I Am Strong*, which features Priscilla Ahn. But then there's *Feel It in My Bones* (Tegan and Sara) and *LA Ride* (with Tiësto intoning '*don't steal this*' in the background) as well, and then, well it's all great actually… totally engineered, of course, but completely infectious.

Conclusion

This is a very impressive amplifier in many ways. Yes, it has a high swing-tag for what is essentially a fairly basic 50-watt stereo amplifier, but when you factor in the superb build quality and superb after-sales support, plus that fact that it's made entirely in Canada by people who enjoy excellent working conditions and are actually being paid a living wage to put it together, I think the price is more than fair.

Peter Croft

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Test Results

Newport Test Labs measured power output into 8Ω as being just over 50-watts per channel (54-watts) when both channels were driven with a frequency of 20Hz. Power output was higher at 1kHz, of course (60-watts per channel), and almost as high at 20kHz (59-watts per channel), but under Australian standards, an amplifier must be able to deliver its rated power at all frequencies between 20Hz and 20kHz inclusive, which means the Moon i-1's output is 54-watts per channel. You can see the output is unregulated by the higher power output power it delivers when only a single-channel is driven, but even so the amplifier's maximum output of 66-watts at 1kHz is still only 1.2dB higher than spec, indicating that there's not a lot of dynamic headroom available.

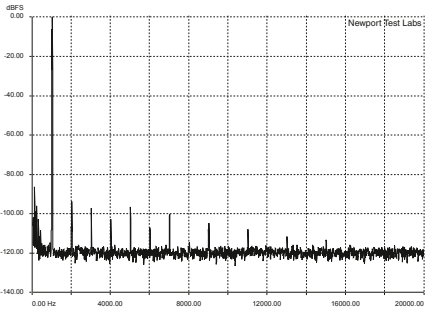
Power output into 4Ω met Simaudio's 100-watt specification at 1kHz, but fell slightly short (96-watts) at 20kHz, and even shorter at 20Hz (82-watts). It easily met specification at all frequencies when only a single channel was driven, as you can see from the tabulated figures.

Although *Newport Test Labs* tested the Moon i-1 into 2Ω loads, it is obvious that the Moon was not designed to drive such low-impedance loads. The tabulated power output figures reflect this. However, on the plus side, at least the Moon i-1 *will* drive low-impedance loads: many modern stereo amplifiers simply go into protection mode under the same circumstances.

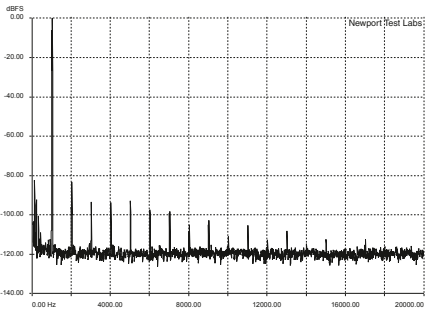
The Moon i-1's frequency response was very wide, extending from just below 10Hz to 99kHz ±0.5dB, with –3dB points at 4.5Hz and 170kHz. As you'd expect from these figures, the response across the audio band was very good, though you can see from the graph (*Graph 5*) that the low-frequency response starts rolling off slowly at 100Hz to be 0.6dB down at 20Hz and rolls off slowly above 10kHz to be 0.2dB down at 20kHz. This puts the 'normalised' audio-band frequency response of the Moon i-1 at 20Hz to 20kHz ±0.3dB. We haven't shown channel separation as a separate graph, but you can see from the tabulated figures that it was good without being exceptional, returning figures of 71dB at 20Hz, 70dB at 1kHz and 67dB at 20kHz. Phase error at these same frequencies was low, with the Moon i-1 returning figures of 0.02°, 0.01° and 0.66°. Channel balance error was higher than expected: 0.9dB.

The spectrogram showing the output spectrum of the Moon i-1 when it was being driven at 1-watt by a 1kHz sine wave shows a spray of low odd- and even-order distortion components, but all are more than 90dB down, indeed the highest, which is the second harmonic at 2kHz, is at –95dB, equivalent to 0.001% THD. Distortion increases only very slightly when load impedance is reduced, as depicted in *Graph 2*. Here, the second harmonic has increased in level to -83dB (0.007% THD) and although the levels of all the other harmonics have risen slightly, all are still more than 90dB down. Note, however, that in both graphs there are some low-frequency noise 'spikes' visible at the extreme left.

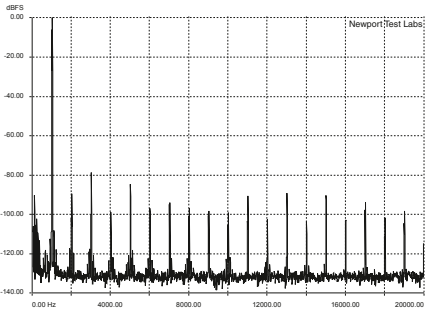
At rated output into 8Ω (*Graph 3*) and 4Ω (*Graph 4*) you can see that the power supply



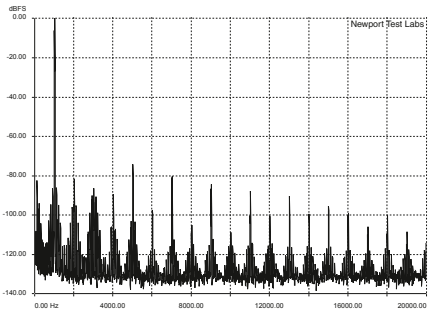
Graph 1: Total harmonic distortion (THD) at 1kHz referenced to 1 watt across an 8 ohm non-inductive load. [Moon i-1 Integrated Amplifier]



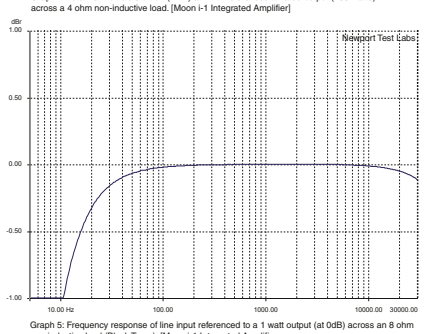
Graph 2: Total harmonic distortion (THD) at 1kHz referenced to 1 watt across a 4 ohm non-inductive load. [Moon i-1 Integrated Amplifier]



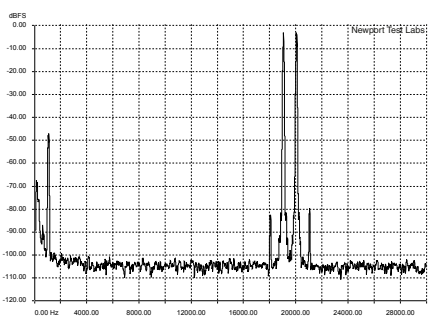
Graph 3: Total harmonic distortion (THD) at 1kHz referenced to rated output (50-watts) across an 8 ohm non-inductive load. [Moon i-1 Integrated Amplifier]



Graph 4: Total harmonic distortion (THD) at 1kHz referenced to rated output (100-watts) across a 4 ohm non-inductive load. [Moon i-1 Integrated Amplifier]



Graph 5: Frequency response of line input referenced to a 1 watt output (at 0dB) across an 8 ohm non-inductive load (Black Trace). [Moon i-1 Integrated Amplifier



Graph 6: Intermodulation distortion (CCIF-IMD) using test signals at 19kHz and 20kHz, referenced to a 1 watt output (at 0dB) across an 8 ohm non-inductive load. [Moon i-1 Integrated Amplifier]

Moon i-1 Integrated Amplifier - Test Results for Power Output

Channel	Load (Ω)	20Hz (watts)	20Hz (dBW)	1kHz (watts)	1kHz (dBW)	20kHz (watts)	20kHz (dBW)
1	8Ω	63	17.9	66	18.1	64	18.0
2	8Ω	54	17.3	60	17.7	59	17.7
1	4Ω	104	20.1	115	20.6	110	20.4
2	4Ω	82	19.1	100	20.0	96	19.8
1	2Ω	26	14.1	51	17.0	32	15.0
2	2Ω	26	14.1	45	16.5	32	15.0

Note: Figures in the dBW column represent the output level, in decibels, referred to one watt output.

Moon i-1 Integrated Amplifier - Test Results (Serial Number I602807)

Test	Measured Result	Units/Comments
Frequency Response @ 1 watt	9.5Hz–99kHz	–1dB
Frequency Response @ 1 watt	4.8Hz–170kHz	–3dB
Channel Separation	71dB / 70dB / 67dB	(20Hz/1kHz/20kHz)
Channel Balance	0.9dB	@ 1kHz
Interchannel Phase	0.02 / 0.01 / 0.66	deg (20Hz/1k/20k)
THD+N	0.01% / 0.01%	1 watt/rated o/p
S/N Ratio (unweighted/weighted)	84dB/90dB	dB re 1 watt output
S/N Ratio (unweighted/weighted)	98dB/106dB	dB re rated output
Input Sensitivity (CD input)	46.0mV/322mV	(1 watt/rated output)
Output Impedance	0.02Ω	OC = 2.8292V
Power Consumption	10.9/12.3 watts	Standby/On
Power Consumption	351 watts /203 watts	1-watt/Rated O/P
Mains Voltage Variation	236–255 volts	Min–Max

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is struggling with what it's being asked to do, clearly evidenced by the appearance of 'sidebars' around the fundamentals and harmonics. The 8**Ω** trace is relatively clean, but the same can't be said about the 4**Ω** trace. There's also quite a bit of distortion present in the output and although it's still relatively low at 8**Ω** (where only the third and fifth harmonics are higher than –90dB) the odd-order harmonic components are mostly higher than the even-order components, whereas it's preferable for it to be the other way around, with the even-order harmonics more prominent than the odd-order. The same trend is evident in *Graph 4*, with the additional note that the individual distortion components are much higher. However, all harmonic distortion components except the fifth (which is at –75dB, or 0.01% THD) are more than 80dB down. However, to put all this in its true perspective, the combined overall THD+N figure measured by *Newport Test Labs* was just 0.01%, meaning that even when combined, all the distortion components would be completely inaudible at all output levels.

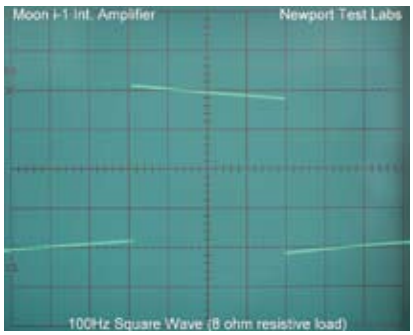
Graph 6 shows the performance of the Moon i-1 when it's driven by two high-frequency test signals spaced 1kHz apart (at 19kHz and 20kHz). Ideally, all we should really see are the two test signals, whereas in this graph, we can see not only two HF sidebands sitting a bit more than 80dB down, but more importantly a regenerated intermodulation signal at 1kHz sitting at around –47dB (0.5% THD). This high level of regeneration at 1kHz is more typical of a valve amplifier than a solid-state device.

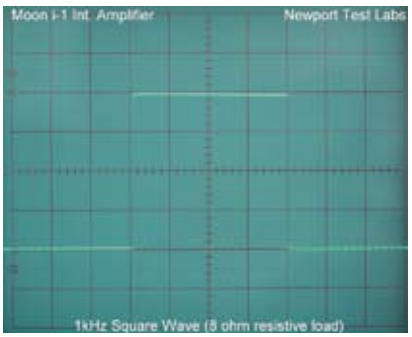
> "the high damping factor that results means you will get excellent control over even the largest of bass drivers."

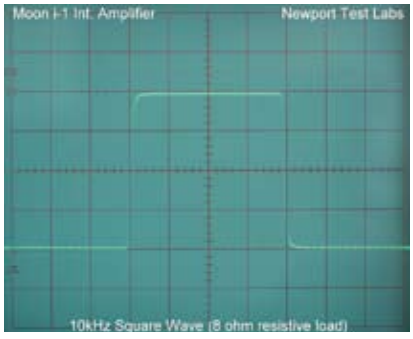
Amplifier noise was low, as you've probably already noticed from the noise floor on the graphs, with *Newport Test Labs* measuring signal-to-noise ratios of 84dB unweighted referred to one watt, improving to 90dB with 'A' weighting. Referred to rated output, the S/N ratios measured were 98dB unweighted and an excellent 106dB A-weighted. Output impedance was also low, meaning the Moon i-1's performance will not be affected by the impedance of the speakers it's being used with, and the high damping factor that results means you will get excellent control over even the largest of bass drivers.

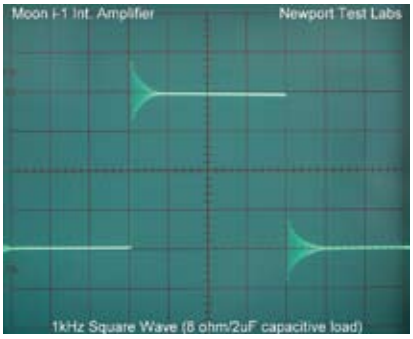
Mains power consumption was relatively high—and particularly so in Standby mode, where the Moon i-1 draws only very slightly less than when it's actually switched on: 10.9-watts *versus* 12.3-watts. No doubt Simaudio's engineers are already working on the 2012 models in order to ensure they will comply with the standby power consumption legislation that will be introduced in Australia in that year, requiring that all mains-powered hi-fi components will have to draw less than 1-watt in stand-by. At rated output, the Moon i-1 will draw 203-watts from your GPO yet, despite this, and despite the lack of dedicated heat-sinking, most of the case runs surprisingly cool. It's only at the bottom of the case, where the output transistors are attached, that the casing becomes more than comfortably warm after extended operation at high power levels.

Steve Holding









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